Air Masses, Fronts, Jet Streaks

Air Masses

- Air mass classification and general identification of air masses on a map

Fronts

- Front type identification and front location.
- Front type id: Movement of the cold air.
- Front location: temperature discontinuity, pressure discontinuity, wind shift, dew point discontinuity, etc.

Jet Streaks

- Quadrant identification construction and identification.
- Areas of upward and downward motion.
- Physical justification of upward and downward motion regions.
  - “Skier” explanation, PVA/NVA explanation
  - Direct and Indirect circulations.

Remote Sensing (Satellite and Radar)

Satellite remote sensing

- Characteristics of Visible, IR, and Water Vapor imagery.
- Strengths and weaknesses of each.

Radar

- Definitions and general characteristics of Doppler and dual polarization radars

Numerical Weather Prediction, MOS, and FOUS

Numerical weather prediction

- Finite differencing techniques (centered, upwind)
- Primarily “Model Types” and “Important Features” slides in PowerPoint presentation.

MOS/FOUS

- MOS: Model Output Statistic, FOUS: Forecast Output – United States
- What are MOS and FOUS?
- Characteristics, strengths, and weaknesses of MOS systems.
• Reading a MOS report.

Divergence, Vorticity, and Upward Motion

Natural coordinates

Divergence

• Mathematical form (Cartesian coordinates)
• If I want you to use natural coordinate form, I will provide it.
  • However, you should be able to explain this form.
• Where does it come from?
  • Acceleration/Deceleration of air parcels.
  • Confluence/Diffluence
  • Very difficult to see if there is a net convergence or divergence from looking at maps alone. Need to do the calculation.
• Why is convergence/divergence important at low levels? What is the result of each?

Vorticity

• Mathematical form (Cartesian coordinates)
• If I want you to use natural coordinate form, I will provide it.
  • However, you should be able to explain this form.
• PVA/NVA
• Why is PVA/NVA important? What is the result of each?

Upward Motion

• Equation is on equation sheet.
• Vertical motions vs. vertical velocity.

Balanced Wind Approximations

Geostrophic Wind

• Equation is on the equation sheet.
• What is it and where does it come from?
• Where does it work best and why?

Gradient Wind

• Equation is on the equation sheet.
• What is it and where does it come from?
• Where does it work best and why?
• How does it differ from the geostrophic wind?
• How does it differ from the real wind?
• Remember sign conventions for radius of curvature.
• Derivations and conclusions based on gradient wind.

**Thermal Wind**

• What is it? Difference in geostrophic wind with height.
• If geostrophic wind backs with height: CAA
• If geostrophic wind veers with height: WAA
• What does WAA and CAA advection imply for vertical motions and thickness changes?
• Review thickness equation.

**Good Luck!**